Claims

What is claimed as being new and desired to be protected by Letters Patent of the United States as follows:

1. A method and system to support customized multi-priority services over any data-link communication layer frame type, comprising steps of:

   assigning and reserving a single and plurality of bytes in a predefined location of the data-link layer frame, preferably adjacent to the trailing bytes of a data-link layer frame;

   the reserved byte(s) are uniquely identified through a fixed byte(s) distance from the trailing or ending flag of a data-link layer frame;

   the reserved byte(s) only contain information pertaining to the operation of the techniques used by the said method and system;

   the reserved byte(s) in a data-link layer frame represent sequence numbers such that each sequence number can be associated with a unique priority service class that needs to be transmitted or received over a single or multiple communication links; and

   the reserved byte(s) in a data-link layer protocol represent sequence numbers such that a predefined range of sequence numbers can represent a unique priority service class being transmitted over a single or multiple communication links.

2. The method and system according to claim 1, wherein the said method can be used and applied on any data link layer frame consisting of and including:

(a) opening and closing boundaries of a frame are determined by a distinct and reserved flag pattern.

(b) opening and closing boundaries of a frame are determined by a distinct and reserved sync bit or byte pattern.

3. The method and system according to claim 1, wherein the said system calculates and updates the CRC (Cyclic Redundancy Check) value comprising the steps of:

calculating the CRC value dynamically over bytes of a data link frame as it is transmitted including the reserved byte(s) value; and

updating the CRC calculation after transmitting a single or pre-determined number of multiple bytes of the said frame including the reserved byte(s).

4. The method and system according to claim 1, wherein the said system can interrupt and seize, if desired, further transmission of any type of data-link layer frame being transmitted on any single or multiple links at any data-link layer frame byte boundary in real time, the method comprising the steps of:

determining the byte position where the ongoing transmission of a data link layer frame needs to be interrupted;

inserting the reserved byte(s) following the interrupting byte position of the data link layer frame;

inserting the updated CRC value following the reserved byte(s) position; and

inserting the closing flag following the CRC value of the data link layer frame or inserting the sync pattern reserved for closing the frame.

5. The method and system according to claim 1, wherein the said system utilizes a scheme that can transmit data-link layer frames as such that any intermediate data-link layer devices or switches are not required to be aware of the presented scheme in order to pass through the data-link layer frames to another data-link layer device which is aware of presented scheme.

6. The method and system according to claim 1, wherein the said system can terminate the further flow of a data-link layer frame using this scheme at any data-link device. Any further outbound communication from the said data-link layer device to any other data-link device can be in the same or an entirely different data-link format.

7. A method and system to support customized multi-priority services over any data-link communication layer frame type, comprising steps of:

implementing a method and system wherein a customized multi-priority algorithm uses a customized feedback for communication requirements to generate traffic priorities of outgoing data-link layer frames over a single or multiple communication links;

assigning weight parameters to a service class such that the assigned parameters can be static or dependent on other variables;

calculating a defined function value for a service class dynamically that depends on the assigned weight parameters;

granting the transmission rights to a service class with the highest numeric result of the defined function value for a time period until the next calculation cycle is executed; and

controlling the transmission of a frame belonging to a service class on per byte basis or in any other byte proportion by means of recalculating the defined function value repeatedly for an interval equivalent to the transmission time for a single byte on a particular transmission link.

8. The method and system according to claim 7, wherein the parameters included in defining the weighing function that controls traffic priorities among the plurality of the service classes are dynamically linked or time dependent on the network conditions.

9. The method and system according to claim 7, wherein the application specific behavior requirements can be defined in terms of weight parameters as included in a service function such that the data transmission rate for the said application can be dynamically adjusted to meet the application requirements.

10. The method and system according to claim 7, wherein the transmission priorities of data-link layer frames on a per byte basis or any proportion can be statically defined by a user's direct input.

11. The method and system according to claim 7, wherein the said multi-priority algorithm provides a way to dynamically adjust and escalate the priority level of an initially declared low priority service to a high priority level. By using this approach a small portion of low priority traffic can be sent as high priority to avoid timeout sessions and retransmits.

12. The method and system according to claim 1, wherein the said system reserves and pre-assigns the position of a single or multiple bytes in a data link layer frame being transmitted on a single communication link such that certain possible sequence values generated by the reserved byte(s) can be uniquely defined and deterministically represent a service class without the need to identify any additional information enclosed in the data link header of the frames belonging to that particular service class.

13. The method and system according to claim 1, wherein the said system uses a unique sequence number range defined by the reserved and pre-assigned byte(s) within a data-link

layer frame being transmitted on a single or multiple communication links such that the assigned sequence range can uniquely represent a distinct service class without the need to identify any additional information enclosed in the data link header of the frames belonging to a particular service class.

14. The method and system according to claim 1, wherein the said system can repeat the assigned sequence number range defined by the reserved sub-framing byte for a particular service class being transmitted over a single or multiple communication links.

15. The method and system according to claim 1, wherein the said system uses a distinct sequence range to represent a unique service class and the sequence numbers within the defined range are used to identify multiple segments of a single frame received by a destination host over multiple links.

16. The method and system according to claim 1, wherein the said system supports a cut-through mechanism for faster transmission of a data-link layer frame through a data-link layer device comprising the steps of:

maintaining the availability status of the outbound link for transmission;

passing through a data link layer frame to the outbound transmission link without incurring any delay as long as the outbound link is available;

interrupting an ongoing transmission of a low priority frame over the outbound transmission link at any byte boundary of the transmitting frame as determined adequately by the System Transmission Policy Algorithm (SPTA); and

start sending a higher priority frame through the outbound transmission link as determined by the SPTA.

17. A method and system to support customized multi-priority services over any data-link communication layer frame type, the method comprising the steps of:

segmenting an outgoing frame into multiple sub-frames that can be transmitted simultaneously over all the communication links available for the transmission of data-link layer frames to a particular destination;

estimating the communication delays of all the available links from a source to a destination for data link layer frames transmission;

segmenting an outgoing frame to the said destination into multiple sub-frames in such a byte proportions that the multiple sub-frames transmitted over diverse communication links reaches to the destination almost at the same time; and

dynamically receiving the feedback about the changing delay characteristics of the network and then dynamically readjusting the individual sub-frame byte size in response to this feedback.

18. The method and system according to claim 17, wherein the said system can modify the data link layer header of the frame to make it compatible with and acceptable to another and different traversing data link layer frame networks.

19. The method and system according to claim 1, wherein the said system can assemble the sub-frames received over a single or multiple communication links, the method comprising the steps of:

identifying the service class by reading the sub-framing byte of a received frame;

in case of multiple received sub-frames, properly assembling them to reproduce the original frame in accordance with the received sub-frames sequence numbers pre-defined for a service class;

removing the sub-framing byte present in each of the individual frame and recalculating the CRC of the frame; and

verifying the calculated CRC value with the received CRC value as appended in the original frame.

20. The method and system according to claim 1, wherein the said system has the ability to handle and accommodate concurrently a diversity of data link layer protocols on the same single or multiple physical layer communication links, the method comprising the steps of:

assigning a pre-negotiated and unique sequence range represented by the sequence byte present in every data link layer frame representing an individual service class;

transmitting the diverse data link layer frames belonging to different set of service classes on the same single or multiple available physical layer communication links;

identifying the start and end of an individual data link layer frame at a receiving end through the flags or the sync bits pattern and not reading any information contained in header of the each of the received data link layer frames;

if necessary, assembling the individual received sub-frames through the sequence number information to reproduce the original frame; and

identifying the service class and type of a received data link layer frame by reading the sequence number contained in the sub-framing byte.

21. The method and system according to claim 1, wherein the said system can be interfaced with a Frame Relay network in a manner that requires only a single DLCI to carry multi-priority services on frame relay frames to a known destination, the method comprising the steps:

identifying all the frame relay DLCIs and associating each of the frame relay DLCI with an individual and distinct service class;

assigning a unique sequence number in the sub-framing byte for the frame relay frames representing each of the individual service classes;

changing all the individual DLCIs numbers identified in the data link header of each of the data frames to only one and single frame relay DLCI number;

identifying each of the individual frame service class at the receiving end by reading the sequence number defined in the sub-framing byte of the individual frame; and

re-mapping the service class identification sequence number to the corresponding DLCI number in the data link header of the frame relay frame.